

“An expert is a person who has made all the mistakes that can be made in a very narrow field.”

- *Niels Bohr*



Agenda for today

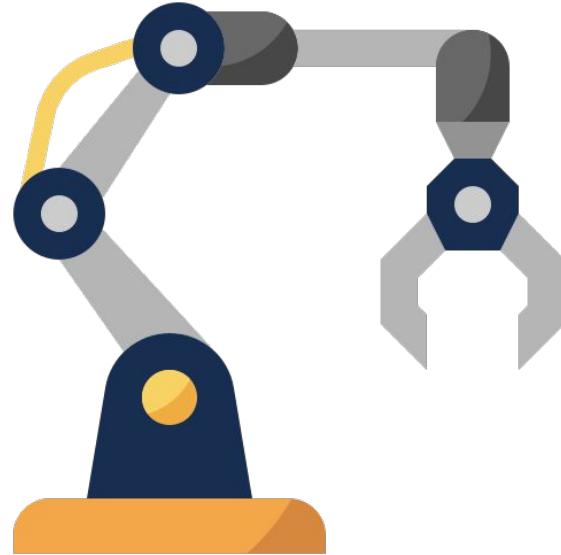
- Quick Recap
- What are actuators?
- Basic Actuators
 - LED, Buzzer, Motor, etc.
- Advanced Actuators
 - Displays
 - Addressable LEDs
 - Servo Motors
 - Stepper motors
 - etc.
- Hands-on with actuators
- Daily Challenge
- Prized challenge 3

Actuators

Adding legs and mouth to devices

What are actuators?

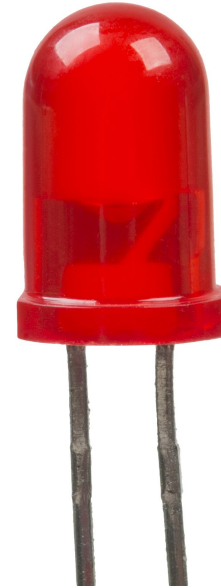
- A device that does actions
- Human beings have Mouth, Legs, Hands, etc.
- Machines also require actuators to indicate, display, move, or tell something.



Basic Actuators

LEDs

- A simple actuator to indicate
- Combination of blink patterns and colors can be used to indicate a lot of stuff
- For a few LEDs, we do not require any driver
- Increasing number of LEDs will require a driver to provide required amount of current



Buzzers

- A simple actuator to indicate
- Combination of sound patterns indicate a lot of stuff
- Does not require any driver while using it with ESP8266



DC Motors

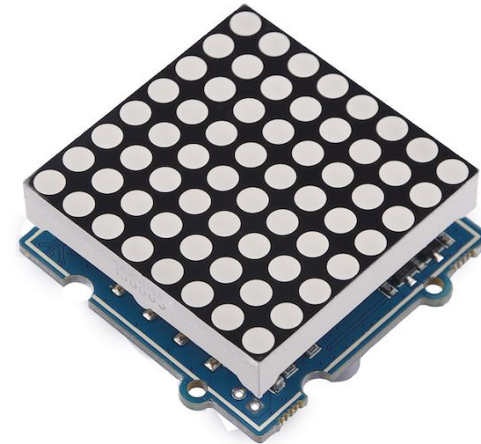
- Converts electrical signal into a rotational motion
- Can be used for different types of actions, for ex; opening doors, moving a robot, lifting things, etc.
- A driver is required to drive a motor



Advanced Actuators

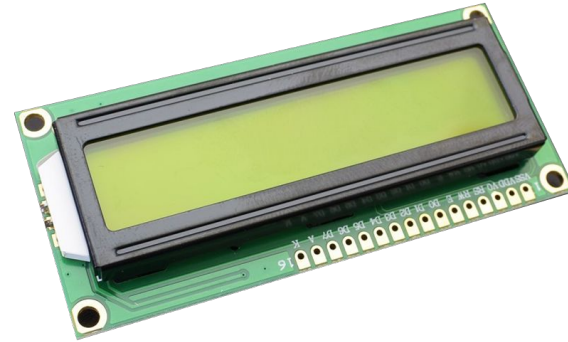
LED Matrix displays

- Can be used to display text and certain patterns
- Requires a driver to integrate with ESP8266
- If the display is bigger, you might require a separate power-supply as well.



LCD displays

- Can be used for displaying images, videos, text, etc.
- Most of time the display comes with its own driver. Sometimes, we might need to use external driver.



OLED displays

- Most of the cheap one are single colored. That means, they are good for displaying texts, icons, and some patterns.
- Come with inbuilt driver.
- Sometimes, you might need to add pull-up resistors to the I2C lines.



E-Paper displays

- Use the e-ink technology to display information
- Very useful for the battery powered applications where we want the device to run for many days.
- Requires a driver board to interface with ESP8266



WS2812 LED (RGB with built in driver)

- We can connect multiple LEDs to a single GPIO pins
- Very useful for the application where we need multiple LEDs but do not have free GPIOs
- Works over a proprietary protocol, information regarding which can be found in datasheet
- Micropython has a built in package to use it.



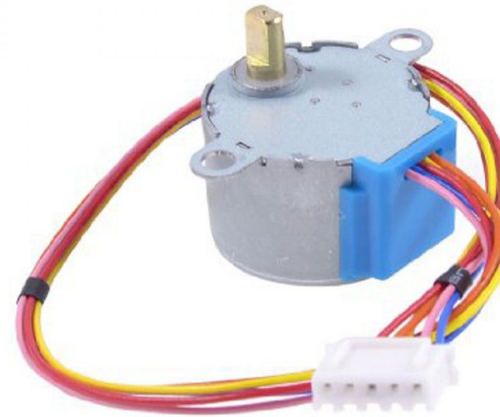
Servo Motors

- Come in 2 variants
 - Constrained angles
 - Continuous rotation
- Useful for the applications where we need accurate angular control
- They do not require a separate driver. However, if we add more of these, we will require a separate power-supply



Stepper Motors

- Converts electrical signal into a rotational motion
- Can be used for different types of actions, for ex; opening doors, moving a robot, lifting things, etc.
- A driver is required to drive a motor



Audio over Speakers

- Converts electrical signal into a rotational motion
- Can be used for different types of actions, for ex; opening doors, moving a robot, lifting things, etc.
- A driver is required to drive a motor

Hands-on

Get your hands dirty

Interfacing Basic Actuators

Connect a Buzzer to ESP8266

Hint: Use the LED blinking code and replace LED with a buzzer in the circuit



Try replacing buzzer with a Motor

Interfacing Advanced Actuators



Interfacing WS2812 LED with ESP8266

Import necessary modules

```
from machine import Pin
```

```
from neopixel import NeoPixel
```

```
from time import sleep
```


Define number of LEDs and the Pin

```
num_pixels = 2
```

```
DIN_pin = 2
```

Define the RGB color value to put on LED

```
color =(126 , 1 , 0)
```

Create an object of NeoPixel Class

```
pixels = NeoPixel(Pin(DIN_pin), num_pixels)
```

Assign color to the LED and display it

```
pixels[0] = color
```

```
pixels.write()
```



Try interfacing LED Ring with ESP8266

Daily Challenge

Problem Statement:

Use Wokwi to integrate servo motor with ESP8266. Move the motor hand to different angles

Hint:

- Sample code for integration is already available in the documentation

Prized Challenge 3

Problem Statement:

- I. Build an end-to-end IoT system with following features:
 - a. A device with actuators and sensors
 - b. Data collection on a cloud platform
 - c. Visualize the data in graphical form in an application running on your local system

Constraints:

- Overall system should be wireless
- Firmware code should be in python. Visualization application can be on any platform for language.

Resources required:

- 1 WiFi enabled Development boards
- A WiFi router/access point to connect the devices



Thank you



GROUP VENTURES

